

# See Special Apollo 11 30th Anniversary Edition inside



# MARSHALL STAR

Marshall Space Flight Center

July 15, 1999

*"We bring people to space — We bring space to people"*

## NASA managers set July 20 as launch date for Chandra telescope

NASA managers set Tuesday, July 20, as the official launch date for NASA's second Space Shuttle Mission of the year that will mark the launch of the first female Shuttle commander and the Chandra X-ray Observatory.

Columbia is scheduled to lift off from Launch Pad 39-B at the Kennedy Space Center, Fla., on July 20 at the opening of a 46-minute launch window at 12:36 a.m. EDT. Columbia's planned five-day mission is scheduled to end with a night landing at the Kennedy Space Center just after 11:30 p.m. EDT on July 24.

Following its deployment from the Shuttle, Chandra will join the Hubble Space Telescope and the Compton Gamma Ray Observatory as the next in NASA's series of "Great Observatories."

Chandra will spend at least five years in a highly elliptical orbit which will carry it one-third of the way to the Moon to observe invisible and often violent realms of the cosmos containing some of the most intriguing mysteries in astronomy ranging from comets in our solar system to quasars at the edge of the universe.

Columbia's 26th flight is led by Air Force Col. Eileen Collins, who will command the Space Shuttle mission following two previous flights as a pilot. The STS-93 pilot is Navy Captain Jeff Ashby, who will be making his first flight into space.

The three mission specialists for the flight are: Air Force Lt. Col. Catherine "Cady" Coleman, who will be making her second flight into space; Dr. Steven A. Hawley, making his fifth flight; and French Air Force Col. Michel Tognini of the French Space



The Marshall-managed Chandra X-ray Observatory awaits launch inside the payload bay of Space Shuttle Columbia.

Agency, who is making his first Space Shuttle flight and second trip into space after spending two weeks on the Mir Space Station as a visiting cosmonaut in 1992.

## Marshall's new rocket team looks beyond the Moon

by Martin Burkey

On the anniversary of mankind's first footsteps on the Moon, there's a new rocket team at Marshall preparing to turn those steps into a highway for others to follow.

Thirty years ago, Dr. Wernher von Braun and his team of engineers and dreamers turned an American dream into reality. That original rocket team at the

Marshall Center built a mammoth rocket called the Saturn V that launched the first humans to the Moon. Today, Marshall's new rocket team is pursuing a dream as challenging and exciting as the first team's dream more than a quarter-century ago.

It's a dream that holds the possibilities of adventure travel to the Moon, solar power satellites tapping the Sun's limitless energy, orbiting movie studios, space

hospitals free from the stress of gravity, laboratories in weightlessness where the pace of discovery is accelerated, and a realistic plan to explore Mars and other planets.

In the early 1960s, the Marshall Center was to design a rocket capable of carrying three brave explorers and their landing craft to the Moon and bringing them safely home again.

**Insure Your Tomorrow,  
Be Safe Today**

David Harvey, EG&G

# Rocket team

*Continued from page 1*

At the dawning of the new millennium, the goal is to open space not only to explorers, but to the man or woman in a business suit, college professors and students, the soldier, movie producer, artist, and family on vacation — as well as to the explorer who needs to get to Mars in weeks, not months. And to get them into space more safely than today at a more affordable price.

The goal 30 years ago when Apollo 11 landed on the Moon was to plant the American flag and return home with soil from another world for study.

The goal today is to build factories, observatories and hotels and return home with cancer drugs, electronics, love letters and cards postmarked “Sea of Tranquility.”

The goal then was to land a man on the Moon and bring him back safely within a decade, and to beat the Soviet Union in doing it. Cost was secondary. Risk was high.

Cost today is primary. NASA’s goal is to lower the cost of launching payloads into orbit from \$10,000 per pound to

\$1,000 per pound within a decade, and to hundreds of dollars per pound in 25 years. Reliability must be increased 100 times. Risk must be minimized.

In charge of meeting those goals is Marshall, NASA’s Lead Center for Space Transportation Systems Development. Marshall leads a diverse team from government, industry and academia that is approaching these new challenges from several aspects.

“Everything we want to do or may want to do in space is stymied by the high cost of getting there,” said Marshall Director Art Stephenson. “It’s not much more efficient to get to space today than 30 years ago when this nation sent Neal Armstrong, Buzz Aldrin and Michael Collins to the Moon. Back then, national pride and Cold War victory were on the line. Being able to ‘afford’ to win these races wasn’t a question then; the pride of our nation was at stake. Opening space to the rest of civilization today involves different economics entirely. The advanced technologies that we are working on today are needed to open the space frontier to benefit all humanity.”

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Today, Marshall engineers and scientists, with their colleagues in industry and academia, are working on lighter structural materials and tougher thermal insulation. They’re designing, developing and building rocket engines that are simpler, cheaper and more efficient for reusable launch vehicles that will operate more like today’s airlines. They’re studying rockets that don’t have to carry their propellants with them, rockets that get a cheap boost from a magnetic catapult and rockets that ride a laser beam into space.

And once in space, according to NASA’s vision, ion rockets 10 times more efficient than chemical rockets will power satellites and spacecraft to the planets. Superstrong tethers, cords that are tens of miles long, will cast payloads toward the Moon. Sunbeams will push paper-thin solar sails miles across space toward the outer planets. And starships powered by the annihilation of matter with oppositely charged antimatter will become more than a physicist’s novelty and a science fiction writer’s dream.

On this 30<sup>th</sup> anniversary of the first human Moon landing, NASA is continuing the dream. Experimental rocket planes are being built and readied for test flights beginning this year. Exotic hardware for trapping antimatter particles is being assembled in a NASA laboratory. And commercial companies are writing business plans to open the space frontier to everyone.

Von Braun and his team took us to the Moon and envisioned space stations and voyages to the planets. The new rocket team is building on their vision, working on ways to make that dream come true.

*The writer, a contractor employed by ASRI, supports the Media Relations Department.*



Courtesy photo

A modified L-1011 takes off June 29 with the X-34 on its first captive carry flight at Dryden Flight Research Center in Edwards, Calif. The X-34 is the testbed for vehicles being developed to reduce the cost of sending payload into space.



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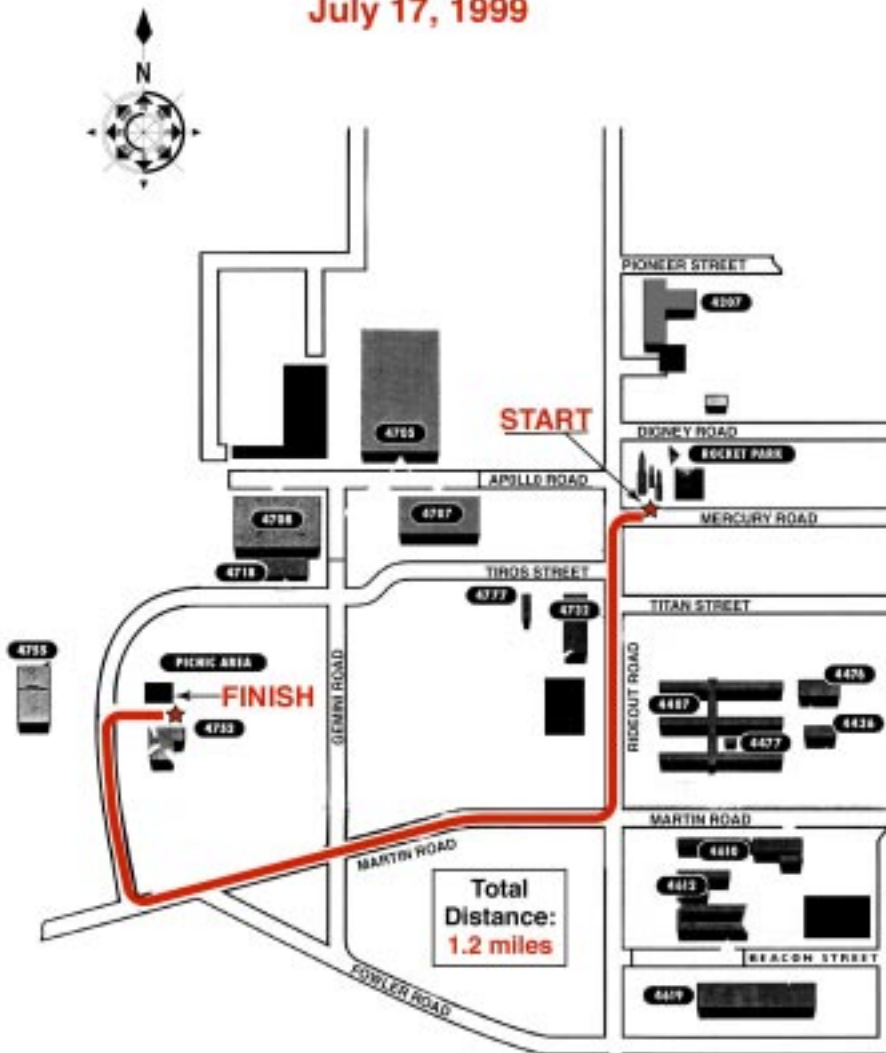


# Marshall Center's Apollo 11 anniversary celebration, picnic to focus on Apollo/Saturn contributions

## Apollo 11 Thirtieth Anniversary *Carrying the Torch Relay*

Marshall Space Flight Center

July 17, 1999



“This is a great opportunity to once again pay tribute to the Apollo astronauts and to the Marshall Saturn launch vehicle team for the greatest accomplishment ever made in space exploration — landing the first humans on the Moon.”

That’s how Sandra Turner, chairwoman of Marshall’s Apollo 11 30<sup>th</sup> Anniversary Committee, sums up the Marshall Center’s plans to mark the anniversary of the first lunar landing this week.

“We have combined the Apollo celebration and the Marshall picnic this year. That’s a great example of the kind of team spirit that marked Marshall’s contributions to the Apollo program,” said Turner. Dawn Cross, chairwoman for Marshall’s Annual Picnic this Saturday, shares Turner’s feelings.

The celebration started earlier this week when local leaders gathered at Marshall. Huntsville Mayor Loretta Spencer; Madison Mayor Chuck Yancura; and Madison County Commission Chairman Mike Gillespie met with Marshall Director Art Stephenson to proclaim Tuesday, July 20, as “Marshall Space Flight Center Day.”

This Friday, Marshall employees will view Saturn era historical footage on Centerwide television. The broadcast starts at 8:20 a.m. and will be timed to coincide with the historic launch of the Saturn V rocket that lifted off the pad at 8:32 a.m., July 16, 1969, to carry the first

*See Celebration on page 10*

## Marshall Director Art Stephenson reflects on Apollo 11

Marshall Director Art Stephenson is among millions who remember watching Apollo 11: It was, he says, indeed, “a moment to remember.

“I was introduced to the space program when I was 15. Our family had moved to Hawaii, where my father was responsible for setting up the ground station to send and receive signals to and from America’s first satellites in orbit. That experience caused me to enter the space business, where I worked on the Apollo Lunar Module.

“That July evening when man first landed on the Moon, I was

meeting with about 30 young people from our church in my role as youth leader and counselor.

“The excitement felt by everyone was catching. Then as I watched Neil Armstrong step on to the Moon from the vehicle that I had a small part in creating, I knew that we had done the impossible.

“That achievement gave me the optimism that has stayed with me to this day. Thomas Carlyle’s statement remains apropos: ‘What the mind of man (or woman) can conceive and believe, it can achieve.’”

# Documentary on Marshall role in Apollo 11 airs Friday on Centerwide TV

As part of this week's Apollo 11 30<sup>th</sup> anniversary celebration at Marshall, a new documentary about building the Saturn V launch vehicle in Alabama will be broadcast over Centerwide television at 2 p.m. on Friday, July 16.

"Thunder In Huntsville," a documentary produced by Alabama Public Television, tells the behind-the-scenes story of how Alabamians mobilized to help the nation meet President John F. Kennedy's 1961 challenge to land a man on the Moon by the end of the decade, according to producer Brent Davis.

"Thirty years ago this summer the world was watching when Neil Armstrong became the first person to set foot on the Moon," Davis said. "But his miraculous journey would not have been possible without the Marshall Center in Huntsville." There thousands of Alabamians designed, tested and built the most powerful vehicle ever created, the majestic Saturn V rocket," said Davis, who produced the documentary for the University of Alabama Center for Public Television and Radio.

The documentary features interviews with Saturn/Apollo era veterans like Alex McCool, who now manages the Space Shuttle Projects Office at Marshall.

"We didn't have a long time to start figuring out how to get to the Moon," says McCool. He remembers Kennedy's

speech only a few weeks after the nation's first astronaut, Alan Shepard, had flown on a Redstone rocket designed at Marshall. "We just put a man in sub-orbital flight. He didn't even go in orbit. It was up and down, a ballistic flight."

But, Davis says, Wernher von Braun was in charge of the rocket program in Huntsville and his legendary German engineers and their U.S.-born counterparts were ready to meet Kennedy's challenge.

"The concept of going to the Moon, what it would take, I have to give a lot of credit to von Braun," said Lee James, who was the Saturn project manager at Marshall.

By 1965, 7,500 people worked for NASA at Marshall and thousands of additional contractors were on site. Huge towers were built so the massive Saturn engines could be test-fired on the ground. When the five new, specially developed F-1 engines were ignited, fire and smoke filled the sky, shock waves rolled and the noise thundered across North Alabama.

The Saturn V was 100 times more powerful than the Redstone rocket. Despite the complexity of the huge project — the Saturn V rocket had 3 million parts — the Alabama workers finished the job ahead of Kennedy's deadline and set an incredible launch record.

"You think about it, they had all those pieces and they never failed," says James.



File photo

**A high camera angle shows view of Saturn V Apollo 11 liftoff.**

"We never lost a Saturn."

"Thunder In Huntsville" shows that this rocket was not only an engineering achievement, but one that required the skills of Alabama's welders, machinists, laborers, clerks and office workers. While the entire nation celebrates the 30<sup>th</sup> anniversary of the Moon landing, Alabama can take pride in the vital role it played in humankind's greatest expedition, Davis said.

## Apollo anniversary memorabilia to be on display at Marshall Picnic

As part of Marshall's Apollo 11 30<sup>th</sup> anniversary celebration and picnic Saturday, a collection of memorabilia will be displayed in Bldg. 4752.

The exhibit, "Signatures of Aviation History," is an extensive collection of letters and photographs signed by the men and women who blazed the trail leading to the first lunar landing.

The display is the private collection owned by Robert Jaques of Hartselle, Ala. Jaques is an active private pilot and an aviation historian. He will be

present to discuss the exhibit that will be on display from 9 a.m. until noon.

Contained in the exhibit is an original letter signed by Orville Wright, as well as the signatures of such notables as Charles Lindbergh, Eddie Rickenbacker, Amelia Earhart, Wernher von Braun, Chuck Yeager and Christa McAuliffe.

One of the unique and rare items in the exhibit is a picture of President and Mrs. Nixon honoring the Apollo 11 astronauts and their wives at the White House. The picture was authentically signed by the

president, the astronauts and their wives.

The collection has been loaned to the National Aviation Hall of Fame in Dayton, Ohio, and to the Air Force's museum at Maxwell Air Force Base in Montgomery, Ala.

Jaques, a Marshall contractor employed by Ai Signal Research Inc., is a historian in the Internal Relations and Communications Department at Marshall.

## Flags at half-staff to honor astronaut Charles 'Pete' Conrad

NASA Administrator Dan Goldin last week ordered flags of the United States to be flown at half-staff throughout NASA in honor of astronaut Charles "Pete" Conrad Jr., who died July 8.

Conrad served as pilot on Gemini 5 in 1965, command pilot on Gemini 11 in 1966, and commander of Apollo 12 in 1969 and Skylab 2 in 1973.

Conrad, the third man to walk on the Moon, was chosen with the second group of NASA astronauts in 1962.

He was born June 2, 1930, in Philadelphia and received a bachelor's degree in aeronautical engineering from Princeton University in Princeton, N.J., in 1953.

Conrad was a retired U.S. Navy captain. He resigned from both NASA and the Navy on Feb. 1, 1974, and entered private industry.



File photo

Charles "Pete" Conrad

## Homer Hickam visits Marshall as part of Apollo 11 celebration

Former Marshall employee Homer Hickam, author of "Rocket Boys," will visit the Center Friday to talk about writing his book and about filming the movie "October Sky."

He will help the Marshall team mark the 30th anniversary of Apollo 11. Hickam will speak to employees in Morris Auditorium in Bldg. 4200 at 10 a.m. After that, he will hold a book signing in the lobby of Bldg. 4200. The NASA Exchange in Bldg. 4752 has copies of "Rocket Boys," as well as Hickam's latest book, "Back to the Moon." Each book is \$23.95.

Hickam began work at the Marshall Center in 1981 as an aerospace engineer. His career included working in propulsion, spacecraft design, as well as training astronauts on science payloads, and extravehicular activities. He was heavily involved in Spacelab and Space Shuttle missions, including the Hubble Space Telescope deployment mission, the first two Hubble repair missions, Spacelab-J (the first training of Japanese astronauts), and the Solar Max repair mission. Prior to leaving NASA in 1998, he was training chief for the International Space Station.

"Rocket Boys" was published in September 1998. It is the story of Hickam's life in the little coal town of Coalwood, W.Va. The book focuses on his high school years from 1957 to 1960 when he and his boyhood friends, with the help and sometime hindrance of their parents and other townspeople, dreamed of careers with NASA while building and launching their own sophisticated rockets. The film, "October Sky," based on "Rocket Boys," was released in February 1999.

A free-lance writer, Hickam has been published in many magazines, including Smithsonian Air & Space magazine. He is the author of "Torpedo Junction," a 1989 military history best seller that tells the story of the battle against German U-boats along the American coast during World War II.

## Local government leaders proclaim 'Marshall Space Flight Center Day'

On Monday Huntsville Mayor Loretta Spencer, Madison Mayor Chuck Yancura and Chairman of the Madison County Commission Mike Gillespie presented Marshall Center Director Art Stephenson with a proclamation.

The proclamation recognized Marshall's contributions to the Apollo program and named July 20 as "Marshall Space Flight Center Day."

The text of the proclamation follows:

**WHEREAS**, on May 25, 1961, President John F. Kennedy committed our Nation to "landing a man on the Moon and returning him safely to Earth;" and

**WHEREAS**, a nationwide government and contractor team representing the NASA George C. Marshall Space Flight

Center in Huntsville, Alabama, responded to that commitment with unparalleled speed, supreme dedication and personnel sacrifice and did design and develop the powerful Saturn V launch vehicle; and

**WHEREAS**, the Saturn V did on July 16, 1969, lift three American astronauts on humankind's first journey to the surface of the Moon; and

**WHEREAS**, that accomplishment, made possible by the Saturn V developed by the Marshall team, did bring increased scientific knowledge, and feelings of pride, hope and goodwill to the entire the world; and

**WHEREAS**, that accomplishment, made possible by the Saturn V, also did demonstrate to the world the creativity,

vision, and talent inherent in the people of Huntsville, Alabama; Madison, Alabama; and Madison County, Alabama;

**NOW, THEREFORE, WE**, Loretta Spencer, Mayor of the City of Huntsville; Chuck Yancura, Mayor of the City of Madison; and Mike Gillespie, Chairman of the Madison County Commission, do hereby designate the day of **July 20, 1999** as **Marshall Space Flight Center Day** And call upon the citizens of Huntsville and Madison County to observe this day with appropriate programs and activities

DATED this Twelfth Day of July 1999

Loretta Spencer  
Chuck Yancura  
Mike Gillespie



# Marshall's Saturn V role vital to Apollo 11 success

by Mike Wright

The date is Aug. 5, 1965. Wernher von Braun, the world's most famous rocket expert, stands on the roof of Bldg. 4200 at the Marshall Center. He and others look south toward the Tennessee River where two miles away a group of engineers are sealed in a concrete bunker.

The engineers stand by to push the buttons on the steel gray consoles that surround them. Von Braun and the others continue to watch from the rooftop. Seconds later, the engineers push the buttons and rush to look through periscopes and slits in the concrete walls that protect them. A continuous plume of flame blasts westward. Thunder rolls. Smoke billows. For two minutes hell unfolds from the base of a mammoth concrete test stand.

The sound and fury generated that day came as the Marshall Center test-fired the first stage for the Saturn V Moon rocket. Throughout the 1960s, Huntsville heard and felt the Saturn rocket's roar. All of the tests were directed toward one goal, one set by President John F. Kennedy in 1961 — land “a man on the moon and return him safely to Earth.” Eight years later, a mammoth Saturn V rocket, standing taller than the Statue of Liberty, left the launch pad in Florida

carrying three humans toward the surface of the Moon.

Going to the Moon was von Braun's dream, and he was ready to share it with anyone on the Courthouse Square in Huntsville or in a hallway in Washington. One of those interested in von Braun's dream was Vice President Lyndon Johnson. In 1961, President Kennedy asked Johnson a question: “Is there any space program which promises dramatic results in which we could win?” Johnson looked to von Braun, who wrote to Johnson on April 29 that the United States had “an excellent chance” of beating the Russians to a lunar landing.

On May 25, after consulting with his top advisers, Kennedy spoke before a joint session of Congress and issued his challenge to land a man on the Moon “before this decade is out.”

Marshall retiree Rocky Clarke remembers the impact that Kennedy's challenge had on the Marshall Center. “Everybody was elated. We wanted to work on a big manned outer space program. We had a real target out there,” he added referring to Kennedy's end-of-decade deadline.

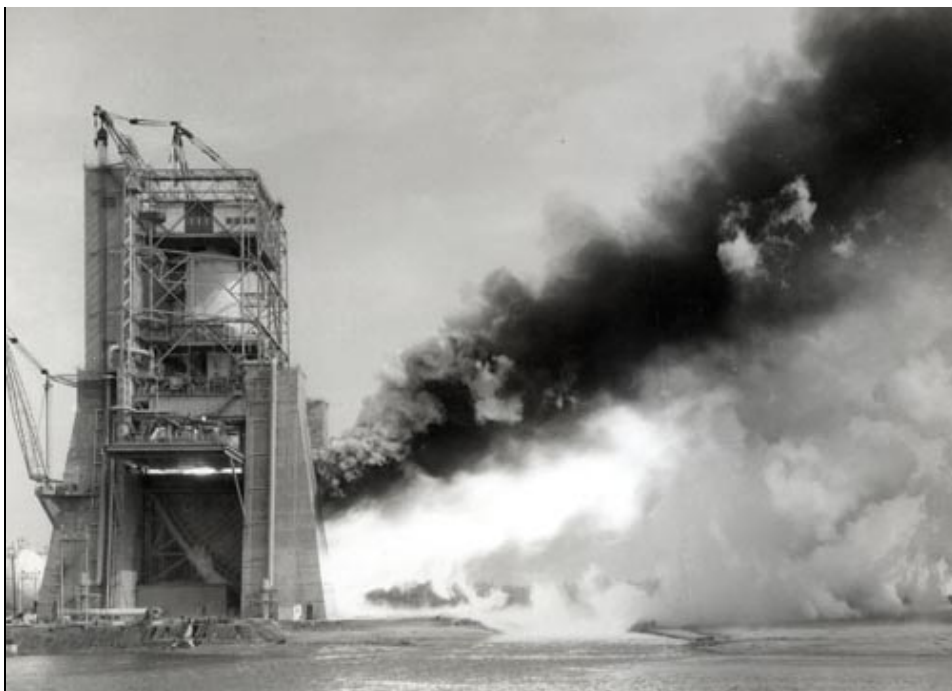
In September 1962, Kennedy got a first-hand look at the Saturn program at Marshall. Greeted by von Braun and others, the president toured the Center's laboratories, watched a Saturn test firing and broke from his official tour to plunge into crowds of employees to shake hands.

But the work on the Saturn V at Marshall was just beginning when Kennedy boarded his plane to return to Washington. The early space race between the Soviet Union and the United States was like a weight-lifting contest. Success meant building a rocket with enough propulsion to lift its weight and the weight of the capsule on top. Bob Schwinghamer, now retired from Marshall, helped von Braun design the Saturn rockets, and he recalls von Braun's obsession with propulsion. Von Braun knew factors like aerodynamic design were extremely important, but he believed that propulsion was paramount. “I can fly a beer can if you give me enough propulsion,” von Braun once told Schwinghamer.

T. Keith Glennan, NASA's first administrator, recalled meeting with von Braun and inspecting one of the first smaller versions of the Saturn, the Saturn I. “As usual,” Glennan recalled, von Braun “spent about half his time talking about exotic trips into outer space.” But Glennan also was amazed at the new rocket that von Braun explained in endless detail. “It is one of the most amazing combinations of engineering, plumbing and plain hope anyone could imagine,” Glennan said.

Marshall built and launched three versions of the Saturn rocket. These included the Saturn I, Saturn IB and Saturn V. Even though they were extremely important, the Saturn I and Saturn IB were really research and development rockets. They lacked the power to accomplish Kennedy's goal of landing a man on the Moon.

That task belonged to the Saturn V at Marshall. Schwinghamer remembers the technical and political challenges. “Con-



File photo

Saturn V S-IC test-firing at the Marshall Center.

See *Role* on page 9

# Marshall supporting salute to von Braun legacy

by Mike Wright

The Marshall Center's Apollo 11 30<sup>th</sup> anniversary celebration coincides with the start of the von Braun celebration of the Arts and Sciences in Huntsville. The local celebration will focus on the 50-year cultural and technological legacy of Dr. Wernher von Braun and the members of his famed German rocket team.

In support of the von Braun celebration, Marshall has arranged for the local premiere of NASA's "The Dream is Alive" art exhibition at the EarlyWorks Museum in Huntsville. The exhibition is free and will be on display through Sept. 15.

To mark the official opening of the exhibition, the Marshall Center, the Huntsville/Madison County Hospitality Association and the EarlyWorks Museum will co-sponsor a "Taste of Germany" reception Thursday evening in the Grand Hall of the museum. Representatives from the Marshall Center, including Center Director Art Stephenson, will attend the event.

Beyond Huntsville, von Braun is recognized for leading the development of the huge Saturn V that lifted astronauts Neil Armstrong, Buzz Aldrin and Mike Collins on Apollo 11.

Huntsville, however, knows von Braun for more than that. The rockets he dreamed of were powered by his engineering and scientific intellect, but they were also powered by his imagination. The seeds of his love for art, literature and music were planted in him as a child growing up in Germany. They continued to grow years later after he moved to Huntsville.

"Deeply involved in the Saturn program in the 1960s, von Braun still supported art and music. He sent encouragement to students attending a national music camp at the University of Michigan. In 1962, Arthur Fiedler, director of the Boston Pops Symphony Orchestra, visited Huntsville. He and von Braun exchanged autographs and "talked music instead of rockets."

Von Braun also supported the arts through Maria, his wife. "For several years when interest in a center for the performing arts flagged among the politicians, we developed the practice of calling Maria and saying 'remind Wernher that we still don't have what we need,'" said one arts patron. Cultural leaders recognized von Braun's influence and made the most of it. As a result Huntsville maintains an atmosphere where the arts can flourish and continue to grow as the community grows.

*The writer is a historian in the Internal Relations and Communications Department.*



**Wernher von Braun**

## Astronauts to join in Marshall Apollo 11 celebration

Several Apollo/Saturn era astronauts will join hundreds of Marshall employees, on-site contractors, retirees, guests and family members this Saturday to celebrate the 30<sup>th</sup> Anniversary of Apollo 11.

Apollo 11 astronaut Buzz Aldrin, Apollo 12 astronaut Richard Gordon, Apollo 7 astronaut Walter Cunningham, Apollo 14 astronaut Edgar Mitchell, Apollo 16 astronaut Charlie Duke, along with Skylab and Shuttle astronaut Owen Garriott are expected to participate. Apollo 15 astronaut Alfred Worden also is expected to attend.

In addition to flying as the lunar module pilot on Apollo 11 in 1969, Aldrin piloted Gemini 12 in 1966. He received a bachelor's degree from the U.S. Military Academy at West Point, N.Y., in 1951 and a doctorate from the Massachusetts Institute of Technology in Cambridge, Mass., in 1963. He is a retired U.S. Air Force colonel.

Gordon was the command module pilot on Apollo 12 in 1969 and piloted Gemini 11 in 1966. He received a bachelor's degree from the University of Washington in Seattle in 1951. Gordon is a retired U.S. Navy captain.

Cunningham was the lunar module pilot on Apollo 7 in 1968. He received a bachelor's degree in 1960 and a master's degree in 1961, both from the University of California, Los Angeles. He is a retired U.S. Marine Corps Reserve colonel.

Mitchell was the lunar module pilot on Apollo 14 in 1971. He received a bachelor's degree from the Carnegie Institute of Technology in Pittsburgh, Pa., in 1952, a bachelor's degree from U.S. Naval Postgraduate School in Monterey, Calif., in 1961, and a doctorate from the Massachusetts Institute of Technology in Cambridge, Mass., in 1964. He is a retired U.S. Navy captain.

Duke was lunar module pilot on Apollo 16 in 1972. He received a bachelor's

degree from the U.S. Naval Academy in Annapolis, Md., in 1957, and a master's degree from the Massachusetts Institute of Technology in Cambridge, Mass., in 1964. He is a retired U.S. Air Force brigadier general.

Garriott was science pilot on Skylab 3 in 1973, and a mission specialist on STS-9 in 1981. He received a bachelor's degree in 1953, and a master's degree in 1957, both from the University of Oklahoma in Norman. He also received a doctorate in electrical engineering Stanford University in Stanford, Calif., in 1960. Garriott resides in Huntsville.

Worden was the command module pilot on Apollo 15 in 1971. He received a bachelor's degree from the U.S. Military Academy at West Point, N.Y., in 1955, and two master's degrees from the University of Michigan in Ann Arbor, Mich., in 1963. He is a retired U.S. Air Force lieutenant colonel.



# Saturn V replica, original rocket tell Marshall role in Apollo 11

A standing replica of the Saturn V Moon rocket, the rocket that lifted the first humans to the Moon, now highlights the Huntsville skyline.

The construction of the replica at the U.S. Space & Rocket Center coincides with plans by the Space & Rocket Center and the Marshall Center to celebrate the 30<sup>th</sup> anniversary of the Apollo 11 mission.

In addition to the vertical replica of the Saturn V at the Space & Rocket Center, visitors there can see a horizontal display of a complete Saturn V. This Saturn V rocket played a vital role in the Saturn program. Like other Saturn V rockets, it had three stages. Taken together, these stages comprised what engineers called the Saturn V "Dynamic Test Vehicle."

Long before NASA engineers committed to the actual launch of a Saturn V, they conducted a series of tests to learn how much an actual Saturn V would vibrate when it lifted off the launch pad in Florida. This meant the three stages for the Dynamic Test Vehicle had to be

brought to Marshall from three different manufacturing points. These tests were completed at the Marshall Center using a facility known as the "Saturn V Dynamic Test Stand" with the Dynamic Test Vehicle enclosed inside.

The entire Saturn V Dynamic Test Vehicle configuration was designated "SA-500D." A 10-week series of dynamic tests in the stand at Marshall was conducted in early spring of 1967. The 363-foot-tall rocket was subjected to more than 450 hours of shaking to gather data from some 800 measuring points. A simulated Apollo capsule was placed on top of the rocket. The simulated capsule had the same weight and the same center of gravity as the actual spacecraft being checked out for launch at Kennedy Space Center.

Forces were applied to the tail of the rocket to simulate engine thrusting. In addition, various other flight factors were fed to the vehicle to test reactions. During some of the shaking tests, the



Launch of Apollo 11

rocket moved as much as 6 inches at the top and up to 3 inches at the bottom. The tests were mandatory before the Center could certify that the guidance system would hold an actual launch vehicle on course.

The Saturn V displays at the Space & Rocket Center will serve as learning tools for those who want to know more about the role Marshall played in Apollo 11.

## Role

*Continued from page 7*

stantly there was this sense of urgency. The cold war was in full swing. It was more than just turning out a product. Man, if you don't beat them they'll beat us. You got it every day in the newspapers."

Meeting Kennedy's challenge meant scaling up the facilities in Huntsville. From 1960 to 1964, existing test stands at Marshall were remodeled and a sizable new test area was developed. The new towers erected for propulsion and dynamic tests were among the tallest buildings in Alabama.

But there were challenges that went beyond facilities. Georg von Tiesenhausen, another Marshall Center retiree, told the Montgomery Advertiser, "There was no precedent for almost everything we did. You couldn't open a book or ask a contractor, you had to come up with it on your own."

Marshall was building the most powerful rocket the world had ever known. That also meant relying on more powerful fuels to power the stages. One of the most dangerous propellants used for the Saturn V was liquid hydrogen. One aerospace company taught its engineers to respect hydrogen-fueled projects by referring to the Hindenburg disaster in May 1937.

Von Braun directed the Saturn V program with enthusiasm.

"We have thrown our hat across the river," he said. In reality, there were two unmanned and three manned Saturn V flights before attempting a manned lunar landing in July 1969. But the importance of those missions seemed pale compared to the launch of Apollo 11, the first mission to carry the astronauts to the surface of the Moon.

Between 750,000 and 1 million persons crowded Brevard County, Fla., to witness the launch of Apollo 11 on July 16. As the Saturn V lifted the Apollo spacecraft carrying astronauts Neil Armstrong, Buzz Aldrin and Michael Collins, there was some applause, but most spectators watched in silence until the Saturn V disappeared overhead. A worldwide audience, including von Braun, focused itself on the launch and on the journey. Margaret Alexander, who works in the Engineering Directorate at Marshall, remembers the launch. "We observed in awe while we shook with the ground," she said.

On July 20, the world watched humans walk on the Moon. The world was elated and focused on the Moon walkers, but the astronauts also remembered the launch vehicle that lifted them toward the Moon. "The Saturn gave us one magnificent ride," Armstrong reported.

*The writer is a historian in the Internal Relations and Communications Department.*

# Celebration

*Continued from page 4*

American astronauts to the Moon.

At 10 a.m. Friday in Morris Auditorium in Bldg. 4200, former Marshall employee Homer Hickam, author of the "Rocket Boys," will talk about writing his book and about filming the movie "October Sky." Following the seminar, he will hold a book signing in the lobby of Bldg. 4200. The NASA Exchange in Bldg. 4752 has copies of "Rocket Boys," as well as Hickam's latest book, "Back to the Moon." Each book is \$23.95.

At 2 p.m. on Friday, Centerwide television will broadcast a new documentary entitled "Thunder in Huntsville," which tells the story of Alabama's vital role in building the Saturn V Moon rocket. The broadcast was produced by Alabama Public Television.

The annual Marshall Center Picnic runs from 9 a.m.-3 p.m. on Saturday at the Marshall Picnic Grounds. Games, parades, entertainment, exhibits, door prizes, food and other picnic fare will be enjoyed by employees, retirees, on-site contractors, their families and invited guests.

Kicking off Marshall's day-long Apollo 11 celebration on Saturday will be an easy-paced relay run to symbolize generations of Marshall teams "passing the torch" from the Apollo era to today, and taking it forward into the future. The event begins at 9 a.m. in Marshall's Rocket Park. Parking for spectators will be available in the Marshall picnic area with bus transportation provided to and from the Rocket Park. Buses will leave the picnic area at 8:45 a.m. (See map on page 2.)

A "Footprints to the Future" Ceremony is planned for 3 p.m. Saturday in Marshall's Von Braun Complex Courtyard. Buzz Aldrin and other Apollo astronauts have been invited to cast their footprints at the starting point of Marshall's pathway to the Moon, stars and beyond. Apollo astronauts Richard Gordon, Walter Cunningham, Edgar Mitchell and Charlie Duke also are scheduled to participate, along with Skylab and Shuttle astronaut Owen Garriott. Also expected to attend is Apollo astronaut Alfred Worden. The ceremony will also include the unveiling of a work designed by Marshall artist Jack Hood. The unveiling is intended to represent the Center's future role in space transportation. Saturn era retirees will be seated in a special section of the complex courtyard. Buses will leave the Marshall Center picnic area for the Von Braun Complex at 2:30 p.m. and return to the picnic area following the ceremony.

Monday's celebration calendar includes "Marshall Space Flight Center Recognition" at the U.S. Space & Rocket Center.

## Leave policy for celebration events explained

**M**arshall civil service employees are encouraged to participate in the Apollo 11 30th Anniversary activi-

ties, and do not have to take leave for on-site events during regular duty hours.

## Quick Look Schedule Apollo 11 30<sup>th</sup> Anniversary Marshall Annual Picnic

### Friday, July 16

8:20 a.m. — Apollo Era Historical Footage, Centerwide TV

10 a.m. — Homer Hickam Seminar/Book Signing, Morris Auditorium, Bldg. 4200

2 p.m. — "Thunder in Huntsville" Documentary, Centerwide TV

### Saturday, July 17

9 a.m.-3 p.m. — Annual Marshall Center Picnic, Marshall Picnic Grounds

9 a.m. — "Passing the Torch" Event, begins at Marshall Center Rocket Park

3 p.m. — "Footprints to the Future" and Unveiling Ceremony, Von Braun Complex Courtyard

### Monday, July 19

9 p.m. — Re-enactment of first manned Moon landing, U.S. Space & Rocket Center (Limited complimentary tickets are available to Marshall civil service employees through organizational directors.)

### Tuesday, July 20

Marshall Space Flight Center Day

### July 16 -Sept. 15

NASA Art Exhibit at the EarlyWorks Museum in Huntsville

The Space & Rocket Center has invited Marshall civil service employees to an evening re-enactment of the first manned Moon landing. Limited complimentary tickets are available through Marshall organizational directors. Ticket prices, along with the schedule for other performances of the re-enactment, are available at 837-3400.

The Apollo 11 celebration at Marshall also coincides with the start of the Von Braun Celebration of the Arts and Sciences in Huntsville celebrating the 50-year cultural and technological legacy of Dr. Wernher von Braun and the members of his famed German rocket team. In support of the local celebration, Marshall has arranged for the local premier of NASA's "The Dream is Alive" art exhibition at the EarlyWorks Museum. The free exhibition will be on display through Sept. 15.



### Hydrogen peroxide engine test successful

A new, low-cost rocket engine fueled by a mixture of hydrogen peroxide and JP-8 - a grade of kerosene commonly used as jet fuel - was successfully tested last month at NASA's Stennis Space Center, Miss. The full-scale engine, hot-fire test lasted 140 seconds. Upon completion of development testing, the upper-stage rocket engine could be used as a propulsion system for reusable launch vehicles, crew transport vehicles and space planes. Orbital Sciences Corporation's Launch Systems Group of Chandler, Ariz., is developing the engine as part of the Upper Stage Flight Experiment, a joint program between Marshall and the U.S. Air Force Research Laboratory at Kirtland Air Force Base, N.M. Additional ground testing is planned at Stennis prior to flight demonstration in late 2001. The test flight will launch from the new commercial spaceport on Kodiak Island, Alaska.

The engine uses a non-toxic, environmentally clean hydrogen peroxide oxidizer and JP-8 kerosene-based fuel to generate 10,000 pounds of thrust. The relatively simple design makes it cheaper than similar rocket engines. Instead of using a complex turbopump to increase the pressure and flow rate of fluids entering the engine, propellant tanks are pressurized. Using peroxide as an oxidizer also saves money. Since peroxide can be

handled at "room temperature," engine materials don't have to withstand the range of temperature extremes required with an oxidizer such as liquid oxygen, which is stored at minus 298 degrees Fahrenheit before it is used in the Space Shuttle Main Engines.

### Fastrac rocket engine tested for X-34 flight

The Fastrac rocket engine has achieved a major milestone in preparation for the first powered flight of NASA's X-34 technology demonstrator. The engine was tested at full power for 155 seconds, the length of time the engine will be required to perform during an X-34 flight. Last month's full-duration, hot-fire test occurred less than three years after engineers at Marshall initiated the concept design of the engine - a much faster-than-usual design cycle. The test demonstrated endurance of Fastrac components working together as a unit for the duration of Fastrac's requirement on an X-34 mission. Full-engine testing is conducted at NASA's Stennis Space Center, Miss., where about 60 more Fastrac tests are planned during the next year.

Fastrac is a new, 60,000-pound-thrust engine designed to boost small research payloads. Each Fastrac engine will initially cost approximately \$1.2 million - about one-fifth of the cost of similar engines. Fastrac is less expensive than

similar engines because of an innovative design approach that uses commercial, off-the-shelf parts and fewer of them. Common manufacturing methods are used, so building the engine is relatively easy and not as labor-intensive as manufacturing typical rocket engines. A mixture of liquid oxygen and kerosene fuels the engine.

### Marshall, Lockheed team for propulsion effort

Marshall and Lockheed Martin Michoud Space Systems of New Orleans, La., have signed a Space Act Agreement to demonstrate a hybrid propulsion sounding rocket system. Hybrid propulsion sounding rockets will be used for a variety of science missions, including weather forecasting experiments. A hybrid propulsion system consists of an inert solid fuel and a separate oxidizer source. Hybrid sounding rockets are safe, inexpensive and environmentally benign. Comprehensive ground testing of the motor and propulsion system will be conducted at NASA's Stennis Space Center, Miss. A flight demonstration of the hybrid propulsion sounding rocket system is planned at NASA's Wallops Flight Facility in Wallops Island, Va., in early 2000. The 50,000-pound-thrust rocket will be capable of lifting a 1,200-pound payload higher than 175 miles.

## Recent survey finds Marshall seatbelt usage up 11 percent

**T**he Safety and Mission Assurance (S&MA) Office found during a recent seatbelt usage survey that 88 percent of drivers and passengers at Marshall buckle up.

Of the 1,302 drivers and passengers observed at three separate locations within the Center's area, 1,154 were wearing seat belts. The usage rate last year was 77 percent.

The National Highway Traffic Safety Administration reports that the national usage rate is about 67 percent. While 88 percent is very good comparatively, and a marked improvement from a similar survey conducted at the same locations and time last year, it is not up to the expectations of Marshall, which is 100 percent.

It also was found that of the 78 personnel observed in service vehicles, only 26 were wearing seatbelts — a usage rate of only

33 percent. This is a significant disparity.

The Safety and Mission Assurance Office recommends that all personnel who use service vehicles and their supervisors take immediate action to correct this discrepancy.

"S&MA will conduct additional monitoring of service vehicles to help assure improvement and identify specific problem areas," said Amanda Goodson, director of the Safety and Mission Assurance Office.

If you are involved in a vehicle accident, the National Safety Council reports that wearing a lap and shoulder belt reduces your chances of serious injuries or death by about 49 percent. Marshall industrial safety team leader Dennis Davis recommends, "If you're not in the habit of wearing a seatbelt every time you drive, 'today' is the best time to start."



## Employee Ads

## Miscellaneous

- ★ Little Tykes Beauty Salon, \$40; Turtle sandbox, \$5; Fisher Price table with 2 chairs, \$35. 859-8221
- ★ Little Tykes Kitchen, \$30; Little Tykes Rocking Horse, \$5. 721-9749
- ★ Playstation system with dual shock controllers; 2 memory cards; 5 top game titles; \$190. 851-6425
- ★ Golf shoes, Nike, man's size 8, \$30. 881-1249
- ★ Discontinued Longaberger baskets. 728-5679
- ★ 80-foot cedar split rail fence, 2 end posts, 7 line posts, 16 10-inch rails, \$75. 864-0465.
- ★ Apple iMac computer with 96MB RAM, Rev. B, bondi-blue with original software, \$850. 837-0656
- ★ Complete Popel pasta machine, \$60; computer chair, \$20. (931) 433-0004
- ★ John Deere Sabre, 15-hp, 46-inch cut, riding mower with mulch kit, under 15 hours, \$1,500 obo. 922-5715
- ★ Pair of Akai 3-way floor speakers, 12-inch woofers, 4-inch midrange, \$20; Krups gold filter (fits #4 cone filter coffeemakers) \$5. 895-6640
- ★ Cherry Chippendale glass-top coffee table, \$150 obo.; Cherry Queen Anne end table, \$125 o.b.o. 464-5774
- ★ Mac Performa, \$400; Nordic Track \$250; 24" Maytag wall oven, self-cleaning, \$250. 883-0865
- ★ Toddler tricycle, \$10. 464-5394
- ★ Exercise equipment: Nordic Track; Health Rider; Diversified Products home gym, \$30 each. 883-4530
- ★ Craftmatic adjustable bed, queen, \$350; entertainment center, \$75. 776-6289
- ★ Tunturi 320E stationary bike with mileage, distance and time computer, \$50. 539-0263
- ★ 7.5 ft. Mountain King Christmas tree with stand, \$40. 880-6267

## Vehicles

- ★ 1992 300ZX 2+2, 5-speed, pearlglow/tan, T-tops, CD, airbag, ABS, 90K miles, \$12,500. 837-1035
- ★ 1989 Bronco II, PW, PDL, A/C, CD, PS, cruise, \$3,995. 881-1904
- ★ 1994 Nissan, Sentra-XE, 90K miles, white, 4-cyl., A/C, cassette, \$5,000. 772-9930

- ★ 1997 Mustang, red, V6, 29K miles, AC, cassette, power, \$13,300. 753-6648
- ★ 1995 Blazer, black, 4.2L, power, 70K miles, \$14K obo. 355-7896

## Free

- ★ Used and already removed chain link fence and accessories. Must pick up. 882-7084
- ★ Welsh Corgi dog, adult female, spayed. 420-8101

## Lost

- ★ Parker pen case with pens. EuroMir pen has sentimental value. 544-2039.

## Found

- ★ Small wallet with coin purse, found at Bldg. 4312, call 544-4758 to identify.

## Wanted

- ★ Longbow or recurve bow, 25- to 35-pound pull for target practice. 582-3422
- ★ Laptop computer, CD and 3.5" floppy drives, 1.5-2 GB hard drive, 32-64 MB memory. 498-5520

## Center Announcements

- ✦ **Hearing Conservation Training** — Mandatory Hearing Conservation Training classes will be held at 9 a.m. and 1 p.m., July 21, in Morris Auditorium, Bldg. 4200. Marshall civil service and contractor employees in the Marshall Hearing Conservation Program are required to attend. Employees in the program include those working in areas which may expose them to excessive noise levels, those who require the use of hearing protection and those who receive a mandatory hearing exam at the Medical Center. If you have any questions, call Environmental Health Services at 544-2390.
- ✦ **MARS Flag Football** — Marshall employees and on-site contractors can sign-up to play men's and women's flag football by calling Len Bell at 544-6724 or send e-mail to: len.bell@msfc.nasa.gov
- ✦ **Management Operations Office Retirees Meet** — The Management Operations Office (MOO) retirees will meet for breakfast/lunch at 10 a.m. on July 22 at the Cracker Barrel in Madison. All

present or former MOO employees are welcome. For more information, call 539-0042.

- ✦ **Shuttle Buddies Breakfast** — The Shuttle Buddies will meet for breakfast at 9 a.m. Monday, July 26, at Shoney's on University Drive West. For more information, call Deemer Self at 881-7757.
- ✦ **MESA Meeting** — All members are invited to the monthly Marshall Engineers and Scientists Association membership meeting at 11:30 a.m. July 22 in Bldg. 4471, room C-105. Refreshments will be served.
- ✦ **Redstone Toastmasters** — Do you want to improve your speech? Visit and join Redstone Toastmasters, which meets weekly at 6 p.m. on Tuesday at Piccadilly Cafeteria in Madison Square Mall. For more information, call Joe Jones at 461-0476.
- ✦ **Lunar Nooners Toastmasters** — The NASA Lunar Nooners Toastmasters Club meets Tuesday at 11:30 a.m. in Bldg. 4610 cafeteria conference room. All Marshall employees, contractors and friends are invited to attend. For more information, call Lee Johns at 544-5142.

## Job Opportunities

**CPP 99-48-CP, Budget Analyst, GS-560-14**, Office of Chief Financial Officer. Closes July 15.

**CPP 99-62-CV, Media Relations Officer, GS-301-15**, Customer and Employee Relations Directorate, Media Relations Department. Closes July 15.

## Worker injured at Space &amp; Rocket Center dies

E'lee Stovall, 49, of Hillsboro, Ala., died July 12 as the result of injuries sustained in a fall June 19 at the U.S. Space & Rocket Center. Stovall, a construction worker employed by Labor Finders for Penwall, was touching up paint on the second stage of the Saturn V replica when he fell. If employees are interested in contributing money, a fund has been established in his name at Colonial Bank, P.O. Box 1708, Huntsville, Ala., 35807.

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